Remarks

1. Summary of Office Action

In the Office Action mailed July 16, 2008, the Examiner objected to the specification on grounds of informalities, and rejected claims 1-17 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement.

2. Amendments to the Claims

Applicants have amended independent claims 1, 5, 9, and 13 to recite the invention more particularly/clearly, as supported by Applicants' specification. (*See*, *e.g.*, paragraphs 0021-0022, paragraphs 0023-0033 and Figures 2 and 4, and paragraphs 0045-0046).

Presently pending in this application are claims 1-17, of which claims 1, 5, 9, and 13 are independent and the remainder are dependent.

3. Response to Specification Objections

In the Office Action, the Examiner asserted that the Applicant has not addressed all the issues in the previous response. The Examiner asserted that "Applicant's drawings and arguments do not disclose a downlink data signal being used by the echo canceller stage." Further, the Examiner asserted that "specification does not disclose exactly how the signal from the 'pre-noise suppression logic' is used by the echo canceller in order to cancel the echo signal." Applicants respectfully traverse these objections.

Among others, Applicant's discussion in the response filed June 9, 2008 addressed how downlink data/pre-noise suppression logic is used in the echo cancellation (pages 10-12 of the response filed June 9, 2008). As previously discussed, Figure 1 depicts a *cascaded* echo canceler adaptive filter arrangement in which the second echo

canceler adaptive filter 84 receives first post-echo canceler uplink data 90 produced by a first adder logic 82. The first adder logic 82 produces this first post-echo canceler uplink data 90 using pre-echo canceler uplink data 64 and first echo estimation data 88 from a first echo canceler adaptive filter 80. As illustrated, it is the *first* echo canceler adaptive filter 80 in this *cascaded* arrangement that directly receives the *downlink data 52* and produces the first echo estimation data 88 used by the first adder logic 82 to produce the first post-echo canceler uplink data 90, which is then subsequently used by the second post-echo canceler filter 84 to produce final post-echo canceler data 98. (*See*, *e.g.*, Applicants' specification, paragraphs 0009 and 0010). Thus, the downlink data 52 is used by the cascaded filter topology, including the second echo canceler adaptive filter 84, for echo cancellation.

Then, with respect to Figure 2, Applicants' specification explains that pre-noise suppression logic 210 *effectively performs at least some of the functions of the* <u>*first*</u> *stage of the overall cascaded (adaptive filter) echo canceler*. In turn, echo canceler logic 214 effectively performs at least some of the functions of the <u>*second*</u> stage of the overall cascaded echo canceller and includes the echo canceler filter 216 and the echo canceler coefficient logic 218 comprising the filter coefficient data generator 220 and an adder logic 222.

As illustrated in Figure 2 and described in the specification, the pre-noise suppression logic 210 receives pre-echo canceler uplink data 64 and the *downlink data 52*, and in response produces pre-noise suppression uplink data 224. In turn, the echo canceler coefficient logic 218 receives the pre-noise suppression uplink data 224 (produced by the pre-noise suppression logic 210 based on the downlink data 52) and the

pre-echo canceller uplink data 64, and in response produces filter coefficient data 226. The filter coefficient data 226 is then provided to the echo canceler filter 216, which produces final uplink data 230. (*See e.g.*, Applicants' specification, paragraphs 0023-0030. *See* also paragraph 0033 of the specification that describes in more detail how the downlink data 52 is processed within the pre-noise suppression logic stage to produce the pre-noise suppression uplink data 224 that is subsequently used by the echo canceler filter 216 and the echo canceler coefficient logic 218/the filter coefficient data generator 220).

For example, paragraph 0030 explains that the echo canceler filter 216 produces the final uplink data 230 in response to the noise suppressed uplink data 228 and the filter coefficient data 226. The echo canceler filter 216 receives the noise suppressed uplink data 228 from the noise suppression logic 212, and receives the filter coefficient data 226 from the echo canceler coefficient logic 218. The echo canceler filter 216 may then perform the adaptive filter function on the noise suppressed uplink data 228 by applying the filter coefficient data 226 previously produced. (*See* also, *e.g.*, paragraph 0006, which explains adaptive filter function of an echo canceler filter).

4. Response to §112 Claim Rejections

As noted above, the Examiner rejected claims 1-17 under 35 U.S.C. § 112, first paragraph, as containing subject matter "which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention." This subject matter has been now cancelled from each of independent claims 1, 5, 9, and 13 (*see* claims amendments above), thus rendering the 112 rejections of claims 1-17 moot.

Further, independent claims have been amended to recite the claimed subject matter more particularly/clearly. It is believed that the specification, as filed, provides support for these claim amendments, such as in paragraphs 0021-0022, paragraphs 0023-0033 and Figures 2 and 4, and paragraphs 0045-0046. Further, it is believed that the art of record does not teach or suggest the subject matter of any of claims 1-17, as now amended.

As now amended, claim 1 for example, recites an echo canceler circuit comprising: (i) pre-noise suppression logic operative to receive pre-echo canceler uplink data and downlink data and in response to produce pre-noise suppression uplink data, (ii) noise suppression logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and in response to produce noise suppressed uplink data, (iii) echo canceler coefficient logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and the pre-echo canceler uplink data and in response to produce filter coefficient data, *the echo canceler coefficient logic operative to receive the pre-noise suppression uplink data from the pre-noise suppression logic, wherein the pre-noise suppression uplink data used by the echo canceler coefficient logic to produce the filter coefficient data has not been processed in the noise suppression logic*, and (iv) an echo canceler filter, operatively coupled to the noise suppression logic and to the echo canceler coefficient logic, and operative to receive the noise suppressed uplink data and the filter coefficient data and in response to produce final uplink data. (Independent claims 9 and 13 now recite similar limitations.)

Similarly, amended claim 5 for example, now recites an echo canceler circuit comprising: (i) pre-noise suppression logic operative to receive pre-echo canceler uplink data and downlink data and in response to produce pre-noise suppression uplink data, (ii) noise suppression logic, operatively coupled to the pre-noise suppression logic and operative to receive the pre-noise suppression uplink data and in response to produce noise suppressed uplink data, (iii) *echo canceler coefficient logic, operatively coupled to the pre-noise suppression logic, echo canceler coefficient logic comprising*: (a) a filter coefficient data generator operative to receive the pre-echo canceler uplink data and post-echo canceler uplink data and in response to produce echo estimation data and filter coefficient data, and (b) adder logic, operatively coupled to the pre-noise suppression logic and to the filter coefficient data generator and operative to receive the pre-noise suppression uplink data and the echo estimation data and in response to provide the post-echo canceler data to the filter coefficient data generator*, the adder logic operative to receive the pre-noise suppression uplink data from the pre-noise suppression logic, wherein the pre-noise suppression uplink data used by the adder logic to produce the post-echo canceler data for the filter coefficient data generator has not been processed in the noise suppression logic*, and (iv) an echo canceler filter, operatively coupled to the noise suppression logic and to the filter coefficient data generator, and operative to receive the noise suppressed uplink data and the filter coefficient data and in response to produce final uplink data.

As noted in the specification, noise suppressors may be employed to reduce the noise content of a transmitted voice signal. While noise suppression techniques may reduce background noise in a static or slowly changing noise environment, both noise

suppression and echo cancellation performance can be significantly degraded by the combined generation of noise and echo signals. (S*ee*, *e.g.*, paragraphs 0008-0012).

Among other advantages, the claimed invention provides a way for echo cancellation and noise suppression to be performed in a non-interfering manner. With the benefit of the claimed invention, the noise suppression logic does not interfere with the generation of the filter coefficient data by the echo canceler coefficient logic, since the pre-noise suppression uplink data used by the echo canceler coefficient logic has not been first processed in the noise suppression logic. (S*ee*, e.g., paragraphs 0021-022 and 0045-0046, and Figure 2).

Accordingly, the echo canceler coefficient logic may model the changing acoustic coupling channel and produce the filter coefficient data that is unaffected by the noise suppressed uplink data. Similarly, the noise suppression logic may produce the noise suppressed uplink data with reduced noise component data without being affected by the generation of the filter coefficient data produced by the echo canceler coefficient logic. Further, the echo canceler filter may perform adaptive echo cancellation function on the noise suppressed uplink data based on the independently generated filter coefficient data. The echo canceler filter can produce final uplink data that has both been processed for echo cancellation and noise suppression, such that these functions are performed in a non-interfering manner. Please further refer to the description at paragraphs 0021-0022, paragraphs 0023-0033 and paragraphs 0045-0046 for more details, and also Figures 2 and 4 that depict the claimed arrangement).

5. Conclusion

In view of the foregoing, Applicants submit that claims 1-17 are in condition for allowance. Therefore, Applicants respectfully request favorable reconsideration and allowance of those claims.

Respectfully submitted,

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